FEDERAL AGENCIES AND DESIGN/BUILD CONTRACTING

by

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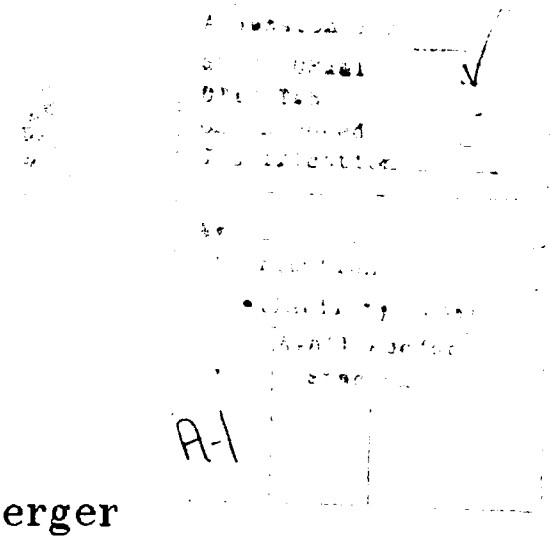

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INTRODUCTION

Recent world events have shown that individual countries are becoming increasingly more dependent upon global economic factors than at any other time in the history of mankind. These economic factors have forced the competitive markets of the world to increase productivity and quality with less cost. In an effort to achieve more with less, leaders of many companies have tried to improve management techniques. Management techniques are not always the only solution. The basic procedures and methods of conducting business are often controlled by industry standards, professional organizations, public interest groups, governmental regulations, and legal systems. These procedures have become the basis of contractual arrangements between parties and have set the standards by which business is conducted.

The largest industry in the United States is the construction industry. The construction industry nets over $400 billion annually and is 8-10% of the gross national product of the United States. The construction industry's largest single customer is the Federal Government. Efficient and cost effective construction of federal facilities is not only beneficial to the tax payer, but it strengthens the national economy by reducing the national debt. The Federal Government has adopted many new management methods, such as Total Quality Management (TQM), to increase its effectiveness. Many federal agencies are also looking at restructuring the way business is conducted, in order to improve

their efficiency. One of the most promising techniques is the adoption of design/build techniques in the acquisition of federal facilities.

There are many advantages for using design/build contracts, yet there are also many restrictions against the implementation of design/build contracting as an alternative form of conducting business. Federal, State, and professional organizations, in order to protect the **public interests** and to maintain **fair and open competition**, have imposed statutes, laws, regulations, and ethical objections against design/build contracting. Many of the reasons for these restrictions stem from unethical contracting practices of the early 19th Century. In view of federal agencies recent need for efficiency in contracting, the rules are being changed, and the future for Federal design/build contracting is bright.

FEDERAL AGENCIES AND DESIGN/BUILD CONTRACTING

CHAPTER I

DESIGN/BUILD AND THE TRADITIONAL MODEL

In November 1987, the former Governor of Colorado, Richard D. Lamm, reported before the American assembly a summary of fifteen national institutions that required revitalization in order to help America regain its global competitiveness. Two of these national institutions have a direct influence on federal agencies' construction contracting efforts. These institutions are federal expenditures and the national political system. Expenditures ultimately draw from our civilian economy and, thereby, weaken the national economy.[1] Inefficiency in federal contracting, as a result of our political system, can also increase expenditures and is a detriment to the revitalization of our national economy.

Federal construction is worth billions of dollars each year. The Federal Government has made significant strides to increase its procurement efficiency. The implementation of new management techniques has greatly enhanced the quality and functionality of many Federal Government agencies. There are, however, few incentives, for innovative construction techniques due to the Federal Government's use of the traditional low-bid contracting method. Without incentives, the construction industry continues to build using routine specifications with traditional construction methods and equipment.

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[1] Lamm, D. L. (1988). Crisis: The Uncompetitive Society. In Martin K Starr (Eds). Global Competitiveness. (pp. 12-42). New York: W. W. Norton and Company, Inc.

There is also very little research and development within the construction industry. The construction industry, which is the largest industry in the United States, invests less than .1 percent of its sales volume in research and development compared with 3 percent for all other industries. Japan, on the other hand, has a national policy that requires one percent of the construction industry's sales volume to be used for research and development. Without such legislation in this country there is little incentive for a contractor to be creative within a system of rigidly specified low-bid construction contracts. As a result, there are very few new construction techniques that originate from American ingenuity.

THE CONSTRUCTION PROCESS

The traditional model of acquiring facilities in the public and private sector has been the low-bid firm-fixed-price contract. This type of contracting provides rigidity, which eliminates the "incentive to build in quality and long life. . . . Innovative contracting, which permits the contractor to use design materials and construction procedures of his choice. . . would encourage innovation and could potentially provide big benefits."[2] "There are innovative procedures and products being used in other parts of the world where performance is not only being measured but is also being demanded. However, these products have been denied access to the American market largely because of our need to be price

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[2] Deen, Tom B. Recent Positions Regarding Design/build. Executive Director Transportation Research Board. April 4, 1990.

competitive. . . . politics, price, and standard practice deny opportunities to employ innovative materials, equipment, or systems."[3]

The procedures of construction contracting in the Federal Government are significantly complicated by the large number of government agencies within the United States. All agencies are governed by the same Federal Acquisition Regulations, yet their interpretation and subsequent agency manuals provide a variety of actual contracting practices. In contracting, we must realize that what we really want in any acquisition is "to get the most building, well-built, for the least cost, in the shortest time with the least headaches."[4]

PROGRAM, QUALITY, BUDGET, AND TIME FACTORS

There are four main factors in contracting for the construction of a facility or project. They are program, quality, budget, and time. The program includes the project's concept of size, function and scope of work. These concepts are then formalized in either performance or design specifications. The quality of a project is an owner's detailed set of criteria assuring that the building will meet the expected results. The budget, all too often, becomes the primary criterion of what the final product may be, or whether or not a project will be funded.

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[3] Gray, John. Recent Positions Regarding Design/build. National Asphalt Pavement Association. April 4, 1990.

[4] Dibner, David R. The Design/build Approach to Acquiring Facilities. Federal Construction Council Report number 89. (1988). (p. 1).

The fourth factor in contracting for a facility is time. Time critical projects can affect the previous factors as well as the scheduling of the project.[1]

CONTROLLING FACTORS

The goals of an owner or Federal Agency while contracting for a construction project are to control these four factors. Different types of contracting methods have varying degrees of control over these factors. The degree of control sought by an owner/agency over a particular project should be considered when a method of contracting is selected.

PHASES OF CONSTRUCTION

The life cycle of a construction project is similar to that of the life cycle of an industrial product. The six phases of a construction life cycle are: concept and feasibility studies, engineering and design, procurement, construction, start-up and implementation, operation and utilization. The disposal or re-cycling of a product or facility is becoming an important factor from an environmental view. Disposal should be evaluated during design prior to the utilization. The chronology of a construction project can cause a significant amount of delay from conception until construction, since the overlap of phases is minimal or non-existent within the traditional low-bid contract. Figure one shows the approximate relationship of the phases of the life cycle of a construction project. The time frames will vary with the project.

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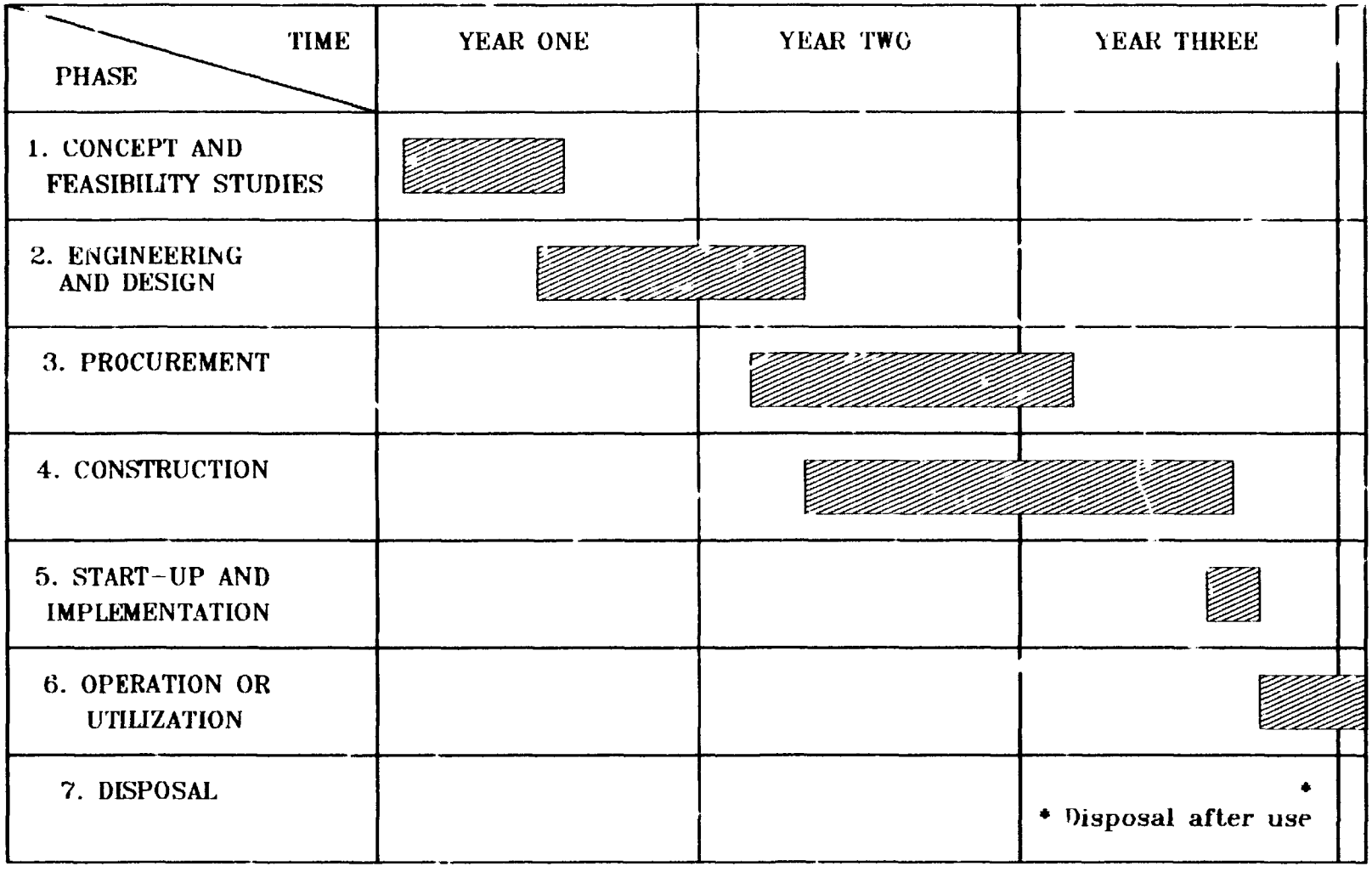
[1] Dibner, David R. The Design/build Approach to Acquiring Facilities. (p. 2).

LIFE CYCLE OF A CONSTRUCTION PROJECT



(Figure 1)

THE CONTRACTING PROCESS

In order for a contract to be valid, it must contain the following basic elements:

1) An agreement - is an offer and acceptance of the terms of the contract.

2) Competent parties - means that both parties must be contractually competent.

3) Consideration - is the money, promise and/or rights given in exchange for the contracted services.

4) Lawful purpose - requires that the contract conform to the legal statutes under which the jurisdiction the contract is performed.

5) The format - of some contracts such as construction contracts should be written in order to avoid dispute.[9]

The Federal contracting process demands strict compliance with written contractual formats. It is also closely scrutinized by the public sector. Formal contracting procedures are mandatory for any federal procurement.

THE CONTRACT TYPES

The Federal Acquisition Regulations(FAR) Manual allows for the following types of construction contracts:

Firm-fixed-price - contracts require reasonably definite design or performance specifications prior to award. Firm-fixed-price lump sum contracts are used in the majority of the federal construction procurement. (FAR 16.202)

Unit Price - contracting is used when the quantity is indeterminate and the cost per unit is fixed. This type of contract can be used for pile driving, excavating, dredging, and similar specialized work. (FAR 16.2 and 12.403(c))

Fixed-price Incentive - contracts are usually negotiated when costs are uncertain. There is a potential cost reduction and/or

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[9] Vaughn, Richard C. (1977). Legal Aspects of Engineering. (pp. 39-40). Dubuque, Iowa: Kendall/Hunt Publishing Company.

incentive for a contractor to perform in order to maximize profit. Its use is very limited in federal construction contracting. (FAR 16.204)

Indefinite Quantity - contracts set a minimum and maximum amount of a specific type of product or units of construction to be purchased. There is a period in which the work orders must be executed. (FAR 16.504)

Time and Material - contracts are restricted in federal contracting, but are used routinely in the private sector for negotiating change orders. Federal agencies primarily use this contract method for overhaul work of vehicles. (FAR 16.601)

Cost reimbursement - contracts use either award or incentive fees. These contracts are used when conditions affecting performance are unknown. (e.g., such as work in war zones.) (FAR 16.404-1 and 16.404-2)

The procedures of the FAR for all types of contracts are very specific and require compliance by all Federal Agencies.

PRIVATE SECTOR CONTRACTING

Contracting in the private sector does not require the same regulatory procedures that are demanded by government contracting. Private parties are allowed some degree of bias in the selection of a contractor. A private party may exclude or otherwise select a contractor that is not the lowest bidder. Selection may be based upon personal preferences or negotiations that exclude specific contractors.

FEDERAL SECTOR AND THE PUBLIC INTEREST

Contracting in the Federal sector is under the scrutiny of the public. To protect the **public interest,** the Federal Acquisition Regulations manual prescribes contractual methods which eliminate bias in the selection of contractors. This is referred to as **fair and open competition.** There is, however, a cost to the public by using fair and open competition with low-bid contracts. Since our

legal system protects the rights of the individual, it is extremely difficult to exclude an unreliable contractor without considerable effort. Exclusion of a contractor based on bias is illegal, while elimination based on responsiveness, lack of dependability, or other reasonable criteria can result in lawsuits. The cost of these lawsuits and the defense of the government contracting system are unavoidable expenses that result from our legal system.

THE TRADITIONAL MODEL

The traditional construction contract of firm-fixed-price low-bid contracting protects the public interest. This method of contracting is accepted by the professional organizations of both architects/engineers and contractors, such as the American Institute of Architects(AIA) and the Associated General Contractors(AGC) of America. It becomes obvious why Federal Agencies prescribe the use of the traditional method of contracting. This method's wide acceptance by all parties involved, as well as its ability to protect the public's interest, eliminates the controversy resulting from negotiated contracts. The rules for conducting the traditional types of contract are also well established in legal precedent.

THE LOW BID CONTRACT

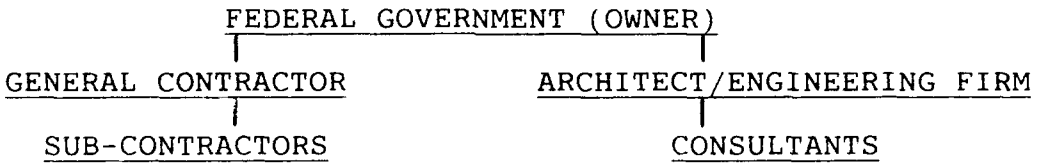
In accordance with the FAR, firm-fixed-price contracts require project criteria to be reasonably definite and/or the performance specifications to be clear prior to bid time. From a contractual standpoint this normally requires the design to be completed by the architect prior to bidding. This eliminates the owner's ability to

overlap the design and construction phases of the project. This also prohibits contractors from being able to suggest construction alternatives or methods, which could save time and money. The low-bid contract further restricts the incentives of a contractor to be creative and inventive in construction. The design sets firm building criteria, which must be fulfilled in order for the contractor to be paid.

ORGANIZATION OF THE TRADITIONAL MODEL

The traditional triad or "golden triangle" of relationships in construction involves the owner, the architect, and the construction contractor. In spite of the many federal agencies, departments, and contracting organizations involved in procurement, the Federal Government is the owner for all federal acquisitions.

Traditional Model Organization



Note: The owner traditionally does not have a contractual relationship with the sub-contractors or the consultants.

ADVANTAGES OF THE TRADITIONAL MODEL

There are significant advantages of the traditional firm-fixed-price low-bid contract beyond that of professional acceptance and the protection of the public interest. (See list below)

Advantages of Firm-fixed-price Contracts

1) A fair and reasonable price can be set at the beginning of the contract.

2) Construction management is minimized for the Federal Agency's Contracting Officer and their staffs.

3) Since the contractor's burden of risk is one hundred percent, the incentive to perform efficiently is maximized.[7]

4) The contractual precedents are usually well established within the legal system.

5) Fair and open competition may provide substantial cost savings.[8]

It is hard to imagine that a low-bid contract could have any faults, however, there are faults with the traditional model.

FAULTS WITH THE TRADITIONAL MODEL

The traditional model does have problems inherent in its form. Some of the major disadvantages are listed below.

Disadvantages to Firm-fixed-price Contracts

1) The design does not usually benefit from construction expertise.

2) The overall design-construct time is usually the longest.[9]

3) There are usually adverse relations that develop between the Government Agency and the general contractor.

4) The Architect often has adverse relations with the general contractor.

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[7] Naval School Civil Engineer Corps Officers. (1988). Advanced Contract Management. (pp. 2-1 to 15-20).

[8] Barrie, D. S., Paulson, B. C., Jr. (1984). Professional Construction Management. (p. 27). New York: Mcgraw-Hill, Inc.

[9] Naval School Civil Engineer Corps Officers. (1984). Construction Contract Administration. (p. 2011).

5) Changes in the scope of work due to unforeseen conditions often result in disputes and litigation, and drive up the cost for both parties.[10].

Is there an alternative to the low-bid contract? If so, can it be used effectively for the procurement of federal construction projects?

THE DESIGN/BUILD ALTERNATIVE

The correction of problems within the traditional contract requires the alleviation of; the length of time from inception through construction, the adversarial relationships between parties, and the inefficiency of processing change orders. The use of a contract that promotes creativity and initiatives towards increased productivity could also stimulate the nation's construction industry and make it globally competitive. Design/build contracting is an alternative contracting technique that accomplishes all of these goals.

DEFINITION

The term design/build infers the combination of both the design and building of a project. This is an oversimplification of the actual design/build relationships used in the construction industry. In some cases the use of any combination of design and construction is mistaken as design/build contracting.

Design/build has also been called "design/construct."[11]

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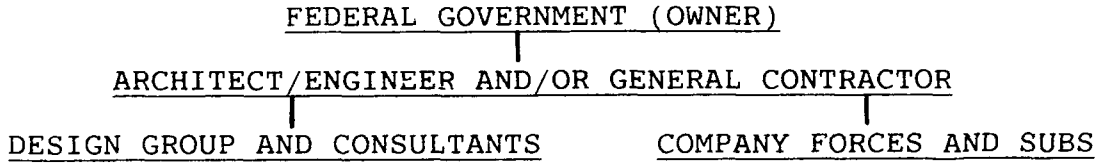
[10] Barrie, D. S., Paulson, B. C, Jr. Professional Construction Management. (pp. 27).

[11] Barrie, D. S., Paulson, B. C., Jr. Professional Construction Management. (pp. 25-29).

TRUE DESIGN/BUILD CONTRACTS

Design/build contracts involve a single contract between the owner and the engineer/contractor. The engineer/contractor in turn is solely responsible for the design and construction of the project. The engineer/contractor employs his own forces or sub-contracts all work associated with both the design and the building of the facility. Congress refers to either process as "turnkey," which implies - one contract with the keys turned over upon the completion of a facility ready for use.[12] The organizational relationships of a design/build contract are as follows:

Organization of a Design/build Contract



VARIATIONS OF DESIGN/BUILD

Under the concept of turnkey there is an alternate version of contracting called "design/manage." Design/management is very similar to design/build, however, the engineer/contractor is an **engineer construction manager.** The engineer construction manager is normally a construction management company that has little or no in-house capability for either design or construction. The firm or engineer construction manager is responsible for sub-contracting all the work involved in the design and construction of a project

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[12] Heery, George T., Thompsen, Charles B. Bridging. A report to the U. S. Air Force Engineering and Services. (January 20, 1991). (3D/International and Brookwood Group). (p. 6).

or facility. This type of contracting is especially beneficial for owners that do not have experience with construction contracting.[13]

THE CONCEPT OF DESIGN/BUILD

The amount of control required during the construction process may be one of the limiting factors of the design/build process. In theory the design/build method is a hands-off project. The owner states the requirements and waits for a finished product. Due to the large investment in facilities, the owner typically remains involved with the project throughout its completion. The owner has special interest in approving the design concepts prior to the various construction stages. The degree and amount of control over the contractor may limit the architect/engineer's creativity, however, the control over the use of a project must be assigned to the owner.

ADVANTAGES OF DESIGN/BUILD

With the re-organization of the contracting relationships of the traditional contracting model, there are some dramatic changes that occur between the relationship of the contractor and the owner. The owner is no longer a referee between the architect and the contractor. There is a much greater chance for a team atmosphere to be developed between both parties. Other advantages are in the list below.

Advantages to Design/build Contracts

1) There is one contract to administrate.

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[13] Barrie, D. S., Paulson, B. C., Jr. Professional Construction Management. (pp. 25-29).

2) The administrative effort for this type of contract is minimal.

3) The design/construct time can be reduced through phased construction.

4) Construction expertise and design creativity can be applied during the design phase.

5) The implementation of the change order process is simplified.[14]

DISADVANTAGES OF DESIGN/BUILD

Besides sacrificing some of the control over a project there are other disadvantages to design/build contracts.

Disadvantage to Design/build Contracts

1) Project costs are not always established until the design is completed.

2) Lump-sum or guaranteed maximum price contracts may sacrifice quality in order for the contractor to maximize profits.

3) Federal Agencies/owners do not have the checks and balances normally used to monitor the efforts of the architect and the contractor, which may result in a project that does not meet its expectations.[15]

THE NEED FOR DESIGN/BUILD

There is a need for design/build contracting for both inexperienced and very sophisticated owners in the commercial

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[14] Barrie, D. S., Paulson, B. C., Jr. Professional Construction Management. (pp. 29-30).

[15] Barrie, D. S., Paulson, B. C., Jr. Professional Construction Management. (pp. 29-30).

industry. Whether an owner needs the expertise of a construction manager or the speed and ease of the standard design/build contract, the advantages can justify the risk over traditional contracting. Federal agencies can benefit from design/build contracting as well. Its use by the Federal Government, however, should be limited to "facility types that the construction community can readily relate to and translate the performance criteria into actual construction."[15]

GLOBAL COMPETITION

A less obvious, but none-the-less very important consideration for the use of design/build contracting is global competitiveness. Our national economic system must become more cost effective. Waste, fraud, and abuse of public funds may cause a national economic disaster. In addition, the close economic ties of the United States with nations engaged in **added-value marketing** make it imperative for America to be competitive in order to be productive and maintain its current standard of living. Design/build contracting can restore the creativity in construction that America once had as the world's industrial leader.

INTEREST RATES AND THE COST OF CAPITAL

The interest rates of several major industrial countries remain lower than those in the United States. Late in the 1960's, the cost of inflation became a dominant concern of the construction industry. As a result of the **cost of capital,** an American firm

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[15] Naval Facilities Engineering Command. (May 1988). Newport Design/build. Prepared by Vincent M. Spaulding. (p. 5).

competing with a Japanese or German firm, gave rise to an overall difference of 2-3% on the total job cost. When large construction jobs were netting only 3-5% profit, the cost of capital caused the difference between an American contractor being the low bid or being able to remain economically solvent. The trend towards higher capital costs can be attributed to America's low savings rate which fell to 3.6 percent in 1987. This was the lowest rate since 1947. Japan, on the other hand, with only half the population of the United States' population, saved over 20% more than Americans did in 1986.[17] The time involved from the design through the construction phase can also significantly increase the cost of a project due to inflation of labor and material costs.

ENERGY AND ENVIRONMENTAL IMPACTS

In the early 1970's, the availability and cost of energy caused major design revisions to the architectural and mechanical systems of construction projects. The construction industry began looking for cost effective alternatives to the traditional method of construction contracting.[18] To meet the rapidly changing construction environment, alternative methods were needed to reduce construction time and to allow the rapid redesign of architectural and mechanical systems. For these reasons and for the owners' desire for the advantages of design/build contracting over traditional contracting, the use of design/build contracts

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[17] Lamm, Richard D. The Uncompetitive Society. (pp. 22-23).

[18] Cushman, Kenneth M. Construction Contracts and Litigation 1990. Practicing Law Institute. (1990). (pp. 11-12).

continued to increase through the 1980's. At the same time the Federal Government gave the authority for each armed service to select three projects for design/construction procurement.[15] Thus the first major emphasis to use design/build contracting by the federal agencies, began in 1985.

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[15] Schroer, C. R. The Design/build Approach to Acquiring Facilities. (p. 11).

CHAPTER II

LEGAL CONCERNS OF DESIGN/BUILD

The legality of design/build contracting was the main topic of the Florida Engineers in Construction(FECON) and the Florida Institute of Consulting Engineers(FICE) design/build conferences for the last two years (1989 and 1990). The opening remarks of both conferences summarize the legal issues involved in design/build contracting. "The rapid growth of the design/build construction process in the 1970's and 1980's threatened to outpace the legislatures, the Courts, the professional societies and the insurance industry. . . . Not only do procuring agencies need to overcome some traditional barriers affecting all design/build construction; these agencies must also confront often archaic government procurement requirements. However, aided by a growing perception that design/build can offer time and cost advantages, the legal structure is rapidly catching up."[2] The same concerns discussed at the state level are equally applicable in the implementation of design/build contracting at the federal level.

STATE STATUTES PROHIBIT DESIGN/BUILD

"In response to public pressure and perceptions of abuse, most state and local procuring agencies are subject to competitive

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[2] Buesing, Robert H., Esquire. Design/Build Contract Management. Part of the 1990 Design/build Conference in Tampa, FL. (p. 2).

bidding requirements."[1] This is the same rationale as; **fair and open competition** in the protection of the **public interest.** As a result, state and local governments have established bidding requirements for the procurement of their facilities. These procedures have become statute and are designed around the traditional low-bid contract method. The Attorney Generals of many states have ruled against the use of design/build contracting primarily as a result of the existence of statues written for the traditional method of contracting. The recent revival of design/build contracting in the private sector has many states revising or giving specific exemptions, which will allow the use of design/build contracts.[2]

PROFESSIONAL ORGANIZATIONS BOYCOTT DESIGN/BUILD

Another significant objection to the use of design/build contracting has been, professional societies such as the AIA and the AGC. The architectural profession has made obvious attempts to separate themselves from design/build contracting since the early 19th century, when "package dealers" offered both design and construction services. "Architects sought to distinguish themselves from package dealers, and adopted ethical principals which required them to put the owner's interests above their own and forbade architects from acting as package dealers. These prohibitions against package dealing and design/build carried over

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[1] Buesing, Robert H., Esquire. Design/Build Contract Management. (p. 5)

[2] Buesing, Robert H., Esquire. Design/Build Contract Management. (pp. 5-24).

into the American Institute of Architect Code of Ethics and state regulatory language for over one hundred years."[1] These restrictions by the AIA, in some cases, have led to unreasonable actions against individual architects-in-training. Some state licensing boards have refused to accept the time in profession of architects practicing with architectural firms engaged in design/build contracting.

The AGC has preferred the use of low-bid contracts for the protection of an individual contractor's rights under fair and open competition. Their fear of design/build contracting has existed primarily due to the misconception that qualifying a contractor on other than low-bid specifications would lead to abuse and bias in the selection of a contractor. "In 1978, the AIA Board of Directors authorized a three-year experiment permitting architects to participate in design/build. The experiment came in response to a call for an end to the ethical prohibition against architects engaged in design/build. By 1980, the AIA Board dropped the ethical prohibitions, canceled the experiment and authorized the drafting of AIA design/build contract documents."[2] The AGC has since adopted similar policies and endorsed design/build contracting as well.

THE BROOKS ACT RESTRICTS PURE DESIGN/BUILD

The Federal Government has also passed laws for the protection of the public interest. Of these laws, one of the most restrictive

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[1] Buesing, Robert H., Esquire. Design/Build Contract Management. (p. 3).

[2] Buesing, Robert H., Esquire. Design/Build Contract Management. (p. 4).

bills against design/build contracting, is the Brooks Act. This bill is a simple page-and-a-half procurement law, which mandates a non-bidding system for federal A/E contracting.[25] Despite its original intent, the Brooks Act restricts the Federal Government from pure design/build contracting.

FURTHER RESTRICTIONS BY FEDERAL ACQUISITION REGULATIONS

The actual implementation of the Brooks Act, within the Federal Acquisition Regulations Manual, fills twelve pages. The procedures have become so burdensome that it takes eight to twelve months to select an A/E for the design of a facility. (Note: The Naval Facilities Engineering Command (NAVFAC) has managed to simplify this process to two and a half months.)[26] In addition "language expressly hostile to the design/build concept was written into the Federal Acquisition Regulations which provides: No contract for the construction of a project shall be awarded to the firm that designed the project or its subsidiaries or affiliates, except with the approval of the head of the Agency or authorized representative."[27] As a result, pure design/build contracting is seldom authorized by federal agencies.

ADDITIONAL DESIGN/BUILD LIABILITY

In addition to the effects of legislatures and professional societies, the Courts are having a major impact on design/build contracting. With the recent revival of design/build construction

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[25] Buesing, Robert H., Esquire. Design/Build Contract Management. Part of the 1989 Design/Build Conference. (p. 2).

[26] Heery, George T., Thompsen, Charles B. Bridging. (p. 30).

[27] Buesing, Robert H., Esquire. Design/Build Contract Management. (1989). (pp. 2-3).

and the revolution of the product liability standards in the 60's, contractor's engaging design/build are finding themselves being held strictly accountable by the courts for their finished products.[28] This is an unprecedented standard, which the construction industry has not had to meet since the guild system of the Middle Ages.[29] Since the earliest development of recorded civilization, architect's have been held to a **professional standard of negligence** in the performance of their duties.

STANDARD OF PROFESSIONAL NEGLIGENCE

Liability has its roots in both common and equity laws but of importance to the construction industry is the distinct difference between **negligence** and **strict liability**. The term negligence has legally been referred to as the doctrine whereby "every person owes to every other person the duty to exercise **reasonable care and skill** in the performance of their duties so as to avoid injuring the other person." A significant difference also exists between the negligence standards of a professional and that of an ordinary reasonable person. The **professional standard of care** only requires the exercise of **average professionally acceptable conduct**, while that of reasonable care requires the ordinary nonprofessional to perform to a higher standard of exercising average, **prudent**

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[28] Vaughn, Richard C. Legal Aspects of Engineering. (p. 255).

[29] Miller, Barry Joseph. The Architect in the Design/build Model: Designing and Building the Case for Strict Liability in Tort: In Case Western Reserve Law Review. (Fall 1982). (Volume 33, pp. 117-118).

reasonable care.[30] The privileged status of professional negligence may, however, no longer be applicable to those firms engaged in design/build contracting.

APPLICATION OF PRODUCT LIABILITY TO DESIGN/BUILD

Strict liability is a term which has not been applied to architects and to engineers professional status in the past. The term strict liability, as viewed by the courts, has historically been applied to products and not to construction. The premise of strict liability requires a standard which allows not only the purchaser of a product, but also third parties to sue in case of physical harm should a product be "in a defective condition unreasonably dangerous to the user or customer."[31] "The trend in the law today is to protect the third party."[32] Applying this standard to design/build firms can place a contractor in a position of defending themselves against lawsuits long after a project has been completed and turned over to an owner for use. The application of strict liability upon the design/build industry has merit under the existing product liability laws that have developed since 1960.

The complexity of modern products and the power of the people in recent times, has all but eliminated the premise of **caveat emptor** (let the buyer beware) in the procurement of products for

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[30] Miller, Barry Joseph. Case Western Reserve Law Review. (pp. 129-130.

[31] Vaughn, Richard C. Legal Aspects of Engineering. (p. 256).

[32] Simon, Michael S. Construction Contracts and Claims. (1979). New YorK: Mcgraw-Hill, Inc. (p. 8).

personal use or even resale.[33] Product liability claims began their foundation with the premise of negligence and implied liability (warrantee). As a result of a court case in 1963 and the difficulty in proving negligence and implied liabilities, the Restatement (Second) of Torts law was passed in 1965, which enforced the premise of strict liability on producers of finished products.[34] It is this very application of law, which is changing the way courts view firms engaged in design/build contracting.[35]

The traditional model of construction contracting separated the architect from the builder. As early as the recorded histories of Egypt, Greece and Rome the architect has been held separate from the laborers.[36] This separation has allowed professionals to be subject merely to the standard of professional negligence when defects arise in the performance of architectural services. Until recently, no architect has ever been held strictly liable in tort in the performance of their duties.[37] Even the standard of implied liability has not been imposed when defective architectural services had occurred. The courts' reasoning is that

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[33] Vaughn, Richard C. Legal Aspects of Engineering. (p. 255).

[34] Vaughn, Richard C. Legal Aspects of Engineering. (p. 256).

[35] Partridge, Philip H., Noletto, Vincent A., Jr. Construction Management: Evolving Roles and Exposure of Construction Managers and Architect Engineers. In American Journal of Trial Advocacy. (Summer 1988). (Volume 12, p. 62).

[36] Miller, Barry Joseph. Case Western Reserve Law Review. (p. 117).

[37] Miller, Barry Joseph. Case Western Reserve Law Review. (p. 119).

"professionals deal with **inexact sciences** and must rely on their skilled judgement" in the performance of their duties.[38]

The concept of design/build has changed the perspective of the courts towards this construction contract. The architect and builder assume the role of both designer and builder and has control over the entire process from design through construction.[39] Since courts view the design/build firm as a prime contractor hired for professional services, it could be assumed that professional standing would afford the same liability protection given to architects in the traditional role. The designer/builder, however, is now "more closely involved with the construction phase of the construction project than the traditional architect."[40] This single contract with the owner clearly has similarities to the product and consumer relationship, which imposes strict liability.

APPLICATION OF IMPLIED LIABILITY

There are varying degrees of liability that can be imposed by the judicial system. The implied liability(warrantee) in contracting followed the premise of negligence during the early development of product liability. The application of an implied warrantee was once thought to have no relation to construction contracting until the case of **Robertson Lumber Company vs. Stephen**

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[38] Miller, Barry Joseph. Case Western Reserve Law Review. (pp. 121-122).

[39] Partridge, Philip H., Noletto, Vincent A. Jr. American Journal of Trail Advocacy. (pp. 62-63).

[40] Miller, Barry Joseph. Case Western Reserve Law Review. (p. 125).

Farmers Cooperative Elevator Company. This was a design/build contract whereby Robertson had agreed to design and build a grain storage facility for Stephen. "The court determined that it was appropriate to impose an implied warranty standard when: (1) the contractor holds himself out as competent, (2) the owner has no particular expertise in design and construction, (3) the owner provides no plans or specifications, and (4) the owner conveys his or her reliance on the skill and experience of the contractor."[41]

Similarly in **Prier vs. Refrigeration Engineering Company,** Prier agreed to design and install a refrigeration system for an ice skating rink after holding himself out to be an expert. When the system failed to perform, the courts held Prior liable on the basis of an *implied warrantee.* Such cases will become more frequent with the increased use of design/build contracting.

APPLICATION OF STRICT LIABILITY

The application of strict liability under section 402A of Restatement (Second) of Torts was originally intended to apply to builder/vendor relationships and manufacturers of products. The application of section 402A has, however, been utilized in cases against architects and professionals engaged in design/build contracts. It was also once considered important to distinguish real property from products in the application of section 402A. Since the law clearly requires that the application of liability be related to products, construction projects were thought to be

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[41] Miller, Barry Joseph. Case Western Reserve Law Review. (p. 134).

immune from the Restatement of Torts. In **Moorman Manufacturing vs. National Tank Company**, however, a grain silo was considered to be a product. The court ruled that by stating the "mere fact that the tank itself has apparently become a part of the real estate itself is not, of itself, sufficient reason to say that it is not a product."[42] This sets a far reaching precedent for all design/build contractors and will affect the cost of insurance on all design/build projects.

INSURANCE CONCERNS OF DESIGN/BUILD

The impact of imposing strict liability, plus the extended design through construction time frame for design/build contractors has caused considerable concern to insurance companies. The initial reaction of insurance companies was to raise premiums rapidly. In the past few years, however, the competition within the insurance industry has brought the cost of design/build insurance back down. Insurance companies offer what is referred to as "project insurance." The purpose of project insurance is to cover all design professionals, not only through the design, but for the entire life of the project plus a three to five year discovery period after construction.[43] Other initiative by the insurance industry include defense sharing arrangements in order to spread the deductible over a longer period. This helps an architect's cash flow and is typically designed for smaller firms.

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[42] Miller, Barry Joseph. Case Western Reserve Law Review. (p. 149).

[43] International Risk Management Institute: Insurance Issues of the 90's. Engineering News Record.

In summary this chapter has pointed out the fact that the our legislatures, Courts, professional societies, and the insurance industry are responding to the need for design/build contracting. The Federal Government has also made headway into adopting design/build strategies into their procurement process. The next three chapters will specifically address the utilization of design/build contracting methods within the Federal Government.

FEDERAL AGENCIES AND DESIGN/BUILD CONTRACTING

CHAPTER III

THE U. S. NAVY'S NEWPORT DESIGN/BUILD ACQUISITION PROCESS

The Department of the Navy has a centralized Command(The Naval Facilities Engineering Command(NAVFAC)) for the acquisition of all of its facilities. All three branches of the Federal Government play an important role in regulating the policies of facility procurement as follows:

The Legislature - establishes the fundamental procurement policies through statutes. With the assistance of the General Accounting Office(GAO), policies are reviewed, and specific agency direction is given in the procurement process.

The Executive Branch - provides more specific implementation of the procurement policy in accordance with the legislative statutes. The General Services Administration(GSA) is specifically tasked with the development of the procurement regulations.

The Judicial Branch - interprets the statutes, regulations and contract provisions who ultimately has a direct effect on the procurement policies as well.

The summary by which all federal agencies operate is the Federal Acquisition Regulations(FAR) Manual, which is published by the Government Services Administration.

THE MOVE TOWARDS DESIGN/BUILD

The traditional model of low-bid contracting, as prescribed by the FAR, is currently the most preferred method of government contracting. The traditional method of contracting has become the

standard by which business is conducted. There has been very limited use of alternative contracting methods by the Federal Government. Recently, however, greater emphasis has been given to changing the procurement system and to increasing productivity within the government. Policies implementing these changes have been developed primarily as a result of recent economic conditions.

CONGRESSIONAL SUPPORT OF DESIGN/BUILD

Excerpts from the FY84 House Appropriations Committee Report number 98-238 (pp. 25-26), contain specific language about the relatively high costs of simple construction projects by the federal government. As a result, Congress has implemented new procedures for obtaining construction projects at a lower cost. The military departments were requested to pursue the use of nontraditional construction techniques for specific projects that would obtain construction goals at reduced federal expense.[43] Specific guidance was given in Public Law 99-167, which provided the authority for each of the armed services to select three projects for design/build procurement.[44]

THE NAVY'S TWO-STEP DESIGN/BUILD PROCESS

NAVFAC, under the Department of the Navy, had already utilized alternative design/build contracts in its procurement process. One of the versions of design/build contracting was referred to as "two-step sealed bidding." Two-step sealed bidding "is a

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[43] Spaulding, Vincent M. Newport Design/build. (p. i).

[44] Schroer, C. R. The Design/build Approach to Acquiring Facilities. (p. 11).

combination of competitive procedures designed to obtain the benefits of sealed bidding when adequate detailed requirements are not available. A form of a performance specification, which allows reasonable flexibility of prospective bidders in providing the required product or facility, is utilized to obtain technical proposals."[45] The two steps are:

Step one - The Navy prepares a request for technical proposal(RFTP). The prospective contractors prepare a submittal, which is then evaluated by the Navy. The Navy classifies the proposals as: acceptable, unacceptable, or capable of being made acceptable. In the last case, the proposers are advised of deficiencies and are given an opportunity to correct their submittal.

Step two - Once the list of acceptable bidders is completed, those that are acceptable will submit sealed bids. The lowest responsive responsible bidder will then be awarded the contract.

THE NAVY'S SOURCE SELECTION PROCESS

Another method the Navy has used for contracting both design and construction services is the source selection process. Source selection is a more sophisticated contracting method than two-step sealed bidding. It involves the selection of a contractor through competitive negotiations. A performance specification is prepared to establish the facility's building criteria.

Two evaluation boards are used to evaluate the proposers compliance with the performance specifications and then rank the

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[45] Spaulding, Vincent M. Newport Design/build. (p. 3).

proposers by their level of conformance. The two boards are the technical evaluation board and the source selection board. The technical board usually consists of technical personnel who review the proposals for solely technical compliance with the performance specifications. The ranking is based upon quality.

The selection board reviews other factors such as price and determines which proposal is the best for the Navy. Final selection, however, is normally made by the Engineering Field Division Commander. The award may be made to other than the low bid if justified.[47]

When it is difficult to adequately establish requirements which can be bid, the use of source selection procedures is recommended for technically complex procurement. An example of this type of project is an explosive handling wharf. The Navy has also been authorized the use of this type of procurement for family housing. As a result, this process has become the normal method of procuring Military Family Housing.

THE NEWPORT DESIGN/BUILD METHOD

The Navy's newest method of design/build contracting is the Newport Design/build method. The Newport method is a very responsive process for rapidly getting designs and facilities under construction. Newport Design/build involves the use of a performance specification to obtain lump-sum competitive bids for design and construction of a project. The award is based simply on the low responsive responsible bidder.

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[47] Spaulding, Vincent M. Newport Design/build. (pp. 3-4).

THE CONCEPT OF THE NEWPORT DESIGN/BUILD METHOD

The Newport Design/build method eliminates the front-end expense of both the technical proposals by the contractors and the Navy's administrative evaluation process involved with the two-step method. The key to the success of the Newport method is the quality of the performance specification prior to bidding. The performance specification is more detailed and is prepared according to the standards Construction Specifications Institute Division format. The specifications provide the requirements for the design and the construction of the facility, as well as the quality assurance requirements for the evaluation of the design and the construction.

Also, in order to meet the design requirements of the Brooks Act and the FAR, the Newport Design/build specifications are much more specific than the two-step method. The design specifications are prepared to the 35% stage by government employees or through independent negotiations with a third party architect. Completion of the 35% design also allows for the appropriation process by Congress.

For added protection of the public interest, there is a clause in the contract which allows the Navy to close out the contract at the completion of the design phase. Should the design not satisfy the functional or aesthetic requirements of the contract, the Navy only pays the contractor 2 1/2% of the contract value. [*] The actual design costs may, however, exceed the 2 1/2% paid.

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[*] Spaulding, Vincent M. Newport Design/build. (pp. 4-5).

COMPARISON OF NAVY TRADITIONAL VS. DESIGN/BUILD METHODS

LCDR Steve W. Johnson, CEC, USN, developed an excellent summary for comparing the various Navy procurement processes. The procurement process begins with authorization and ends with the contract closeout. There are eight interdependent characteristics used through the process. They are as follows:

The Procurement Strategy - may either be through the traditional low-bid method or by design/build contracting. When the government knows what it wants; there is reasonable confidence in the cost estimate; there is reasonable expectation of competition; and there is no need to accelerate the project then the traditional method is recommended for use. When any of these conditions are not meet and the project has a direct commercial counterpart, then design/build strategy may be appropriate.

The Specification Types - are determined by the selection of a procurement strategy. The traditional method requires a complete prescriptive specification with all design details provided. Design/build contracting requires preparation of a performance specification which describes the end product only. The contractor is allowed to be creative in meeting the performance specifications.

The Contracting Method - can be differentiated by the solicitation type, solicitation response, and the award basis. The traditional method uses sealed bidding, while design/build contracting can use sealed bidding or negotiations. The Newport design/build method uses sealed bidding only.

Contracting Methods Variations - can exist within the design/build methods. Within sealed bidding there is the option of Newport or two-step contracting. Negotiated evaluations can be based on either a weighted or a non-weighted system of point selection.

The Solicitation Type - refers to the type of response required by the offerors. Sealed bidding requires an invitation for bid(IFB), while requests for proposals(RFPs) and requests for technical proposals(RFTPs) require detailed responses which must be in the form of a formal proposals. The Newport method uses RFTPs.

The Solicitation Response - is either the bid price or the proposal submitted by the contractor.

The Contract Type - determines how the contractor is paid. In construction, both fixed-price and cost reimbursable contracts are possible. Cost reimbursement contracts require negotiation.

The Award Basis - refers to the evaluation of the response. With sealed bidding, the contract is awarded to the low responsive responsible bidder, while with negotiation the award goes to the successful proposer. The successful proposer submits to the government the most advantageous proposal, which may not be the lowest bid.[14]

(Note: see Figure (2) on the next page for a summary flow chart of these comparisons.)

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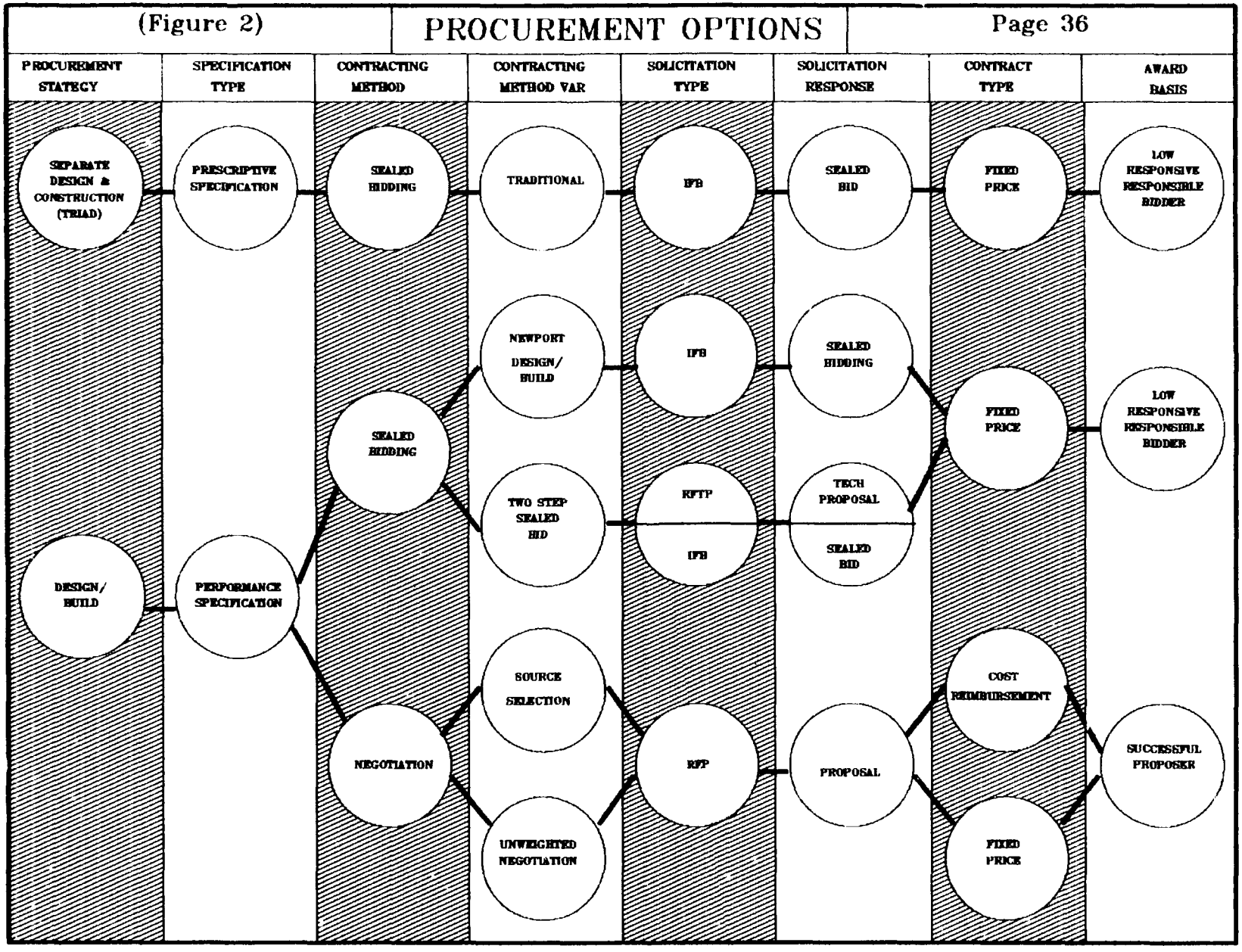
[14] Johnson, Steve W. Part of Newport Design/build. (Attachment 1).

(Figure 2)

PROCUREMENT OPTIONS



PROJECT TYPES RECOMMENDED WITH NEWPORT DESIGN/BUILD

"The Newport design/build contracting strategy is recommended for use in the acquisition of facility types that the construction community can readily relate to an translate the performance criteria into actual construction. The services of established design/build companies provide the best opportunity for success with the use of this methodology. However, joint ventures between established design firms and general companies should also be able to accomplish construction utilizing this contracting strategy."[30] The recommended types of facilities for Newport design/build contracting include:

1) General use facilities (i.e. administrative, community facilities, etc.

2) Bachelor enlisted quarters (barracks)

3) Warehouses

4) Water and fuel tanks

5) Buildings with repetitive design features

THE NEWPORT DESIGN/BUILD CONTRACT

The Navy's Newport design/build strategy uses an invitation for bid(IFB) to solicit a sealed bid from the bidders. The IFB consists of two parts:

1) The contractual requirements - are similar to the traditional method of contracting.

2) The technical requirements - refers to the performance specifications.

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[30] Spaulding, Vincent M. Newport Design/build. (p. 5).

Some specifics of the contractual requirements are that, the contract does not only have the traditional standard construction contract clauses, but it also contains supplemental A/E contract clauses. The contract is between the Navy and the prime contractor, who remains responsible for the design and the construction of the project. The only interface with the architect must be through the prime contractor. The Navy requires, however, that the design personnel must be registered professionals.[51]

CSI MASTERFORMAT

The Construction Specifications Institute(CSI) Masterformat is the basis for the Newport design/build technical requirements. CSI Masterformat allows both performance and prescriptive specifications for a project. Except for the mechanical and electrical equipment, all performance specified items are located in Division 13 (Special Construction).[52]

THE PERFORMANCE SPECIFICATION

The use of performance specifications with the Newport method varies from the traditional use of prescriptive specifications. The specification must identify "the terms and requirements that must be satisfied, and the degree of service expected of the material components involved. They do not inhibit or exclude any design or technical solutions that will satisfy user requirements. Only those design features that are critical to the functional use of the facility were specified in detail. . . . The

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[51] Spaulding, Vincent M. Newport Design/build. (pp. 7-8).

[52] Spaulding, Vincent M. Newport Design/build. (p. 8).

architectural treatment of the building exterior is constrained only to the extent that it must be consistent with current practice in the industry."[53]

Within the performance specifications, there are three subsystems for evaluating proposals. These include:

A Requirement Statement - which states the desired end result in qualitative terms.

A Criterion Statement - which is a definitive statement of a performance level for a particular requirement. It must be measurable or observable.

The Test or Evaluation Statement - which is the method of measuring and of verifying the performance level.

Since this type of specification specifies the end to be achieved rather than the means to achieve the end, there is a considerable amount of incentive for creative and cost effective methods of construction to be utilized.[54] This is, perhaps, one of the hidden benefits of design/build contracting which is often overlooked.

RESULTS OF THE NAVY'S NEWPORT METHOD

The Navy's first projects involving the Newport design/build method were conducted in Newport, Rhode Island and Charleston, South Carolina. Both of these projects were FY85 projects. Since that time, six more project have been awarded, using the Newport method, with excellent results. Figure (3) summarizes the first eight Newport design/build projects.

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[53] Spaulding, Vincent M. Newport Design/build. (p. 7).

[54] Spaulding, Vincent M. Newport Design/build. (p. 8).

NAVAL FACILITIES ENGINEERING COMMAND

NEWPORT DESIGN/BUILD SUMMARY

Project and Location	Programmed Amount	Awarded Funding Requirement	Savings
FY85, P-317, Family Services Center NETC, Newport, R. I. Note: Pilot Project	$690,000	$753,000	-9%
FY85, P-819, Potable Water Storage Tank NWS, Charleston, S. C. Note: Pilot Project	$1,630,000	$1,045,000	+36%
FY86, P-210, Micro-wave Tower Portion of Project ACTB, NAS, Cecil Field, FL	$1,200,000	$1,085,000	+10%
FY89, P-368, Water Storage Tanks, NPWC, Great Lakes, IL	$1,930,000	$1,109,000	+43%
FY90, P-991, Child Development Center NSB, New London, CT	$1,000,000	$807,157	+19%
FY90, P-993, Child Development Center NAS, Brunswick, ME	$1,000,000	$810,186	+19%
FY90, P-994, Child Development Center NSY, Portsmouth, NH	$1,000,000	$797,101	+20%
FY90, P-606, Parking Structure, NH Hospital	$7,500,000	$5,631,780	+25%

Note: The average cost savings over the programmed amount was 20%. ($2.5 million in FY90 Newport construction were yet to be awarded when this data was prepared.)

(Figure 3)

PROSPECTIVE ON THE FUTURE OF THE NAVY'S NEWPORT METHOD

The success of the Navy's Newport method is obvious from an economic standpoint. It is also successful in reducing the administrative burden that it reduces for contract personnel. The Navy's Newport design/build method combines the best features of the traditional architect and of the design/build contracting in order to avoid problems associated with both methodologies.

The $13 million allocated, in FY90, for the Newport design/build method, confirm this success. In addition, the success of the program has led NAVFAC to set new goals for the Command in FY90. One of those goals was that each Engineering Field Division should execute at least two projects utilizing alternative design/construction methods such as the two-step, source selection, or the Newport design/build method.[55] The future of design/build contracting within the Department of the Navy, is very promising.

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[55] Smith, Robert F., Cowan, Richard F. Alternative Design/Construction Methods: Let's Try Something Different. Navy Civil Engineer. (Spring 1991). (p. 8).

FEDERAL AGENCIES AND DESIGN/BUILD CONTRACTING

CHAPTER IV

BRIDGING - THE U. S. AIR FORCE DESIGN/BUILD CONCEPT

The U. S. Air Force uses a hybrid design/build method known as Bridging. In its development the Air Force had two key factors, which had to be taken into consideration. "First, the solicitation must be structured in such a manner that the maximum possible competition can be obtained. Second, the solicitation must have escape provisions that will allow the government to back out at set phase points and not be locked into an unreasonable design or construction project."[56]

Bridging was originally developed by George Heery as an alternative process for bidding construction, which originated from the integration of the traditional process and design/build. Although George Heery's process was based on fixed-price contracting, it managed to incorporate construction knowledge into the design and smooth the division of responsibility between the design and construction teams. The metaphorical term Bridging was given to this process describing the unique method, whereby, design and construction were "bridged" or interrelated.[57]

THE CONCEPT OF BRIDGING

Current trends indicate that there is a significant need for alternative bidding processes in the construction industry. In

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[56] Cole, J. B. The Design/build Approach to Acquiring Facilities. (pp. 17-18).

[57] Heery, George T., Thompsen, Charles B. Bridging. (p. 6).

developing Bridging, George Heery focused on the current construction problems and tried to incorporate solutions over the traditional methods of contracting. Although this method is similar to design/build, it does not require the contractor to propose drawings but obligates the contractor to bid the design specified in the contract documents under an enforceable fixed price. For a better understanding of this requirement we should define the difference between "contract documents" and "construction documents" as they are used in Bridging.

Contract documents are prepared by the Government's A/E Firm. They include the **basic** drawings and specifications of the project. The construction documents on the other hand, include the **final** drawings and specifications produced by the contractor's A/E for construction purposes. In the case that the contract and the construction documents do not agree the contract documents govern.

Bridging is a bidding technique, which integrates both design and construction **knowledge**. This method obtains bids for construction from 35% to 50% design documents, rather than from a complete design as in traditional methods. It gives a contractor the authority to be innovative during the design phase.[58]

THE REASON FOR BRIDGING

The reason for implementing Bridging was to help the Government become more effective in procuring facilities. Simple observations of common construction problems and their

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[58] Heery, George T., Thompsen, Charles B. Bridging. (pp. 7, 6, and 12).

corresponding solutions has led to the development of Bridging. These observations and their solutions include concern for; time and costs, approvals and entitlement, and construction specialization.

The major concern of the Federal Agencies is the loss of time and money due to the current bidding process. Projects are currently required to be 35% designed before being submitted to the Department of Defense and the Congress for appropriation. This requirement costs as much as 50% of the total design fee. In addition, since 40 % of the estimates are mistaken, they do not get approval from the Congress. This indicates that the existing system unnecessarily increases the costs of a project. The time elapsed between the initial design and the start of the construction is usually two and a half years. This causes problems that cost money or may even jeopardize the completion of the project. In addition, the change of leadership in the Air Force and its views concerning the project's needs, interrupt the design and make its implementation very difficult. In such cases the members of the new design or management team may change the original scope and concepts of a project. The consequences of this are confusion, continuous cost overruns, and delays that often result in project delays.

Another area of the construction industry that needs special attention is the approvals and entitlement process. In the past approvals and entitlement have been obtained prior to design and construction. In such cases when the requirements of the project

were not fully understood and/or the appropriate approvals had not been obtained the project was delayed or redesigned. By keeping a project in an alphanumeric state, it is rendered flexible to design changes, and is eventually more economical.

The increased complexity and specialization of the construction industry indicates another problem area that needs to be alleviated. Products of current technology are sometimes so advanced that A/Es and general contractors can not understand the techniques that are used. Therefore general contractors and A/Es need to rely on specialty design contractors or manufacturers to integrate progressive design knowledge into the construction. The Bridging process helps to motivate skilled A/Es to understand new management and construction technology. It also allocates the responsibility among the construction participants and reduces the number of claims.[59]

THE BRIDGING PROCESS

Bridging proposes a project estimate based on a tight but achievable budget, instead of a detailed design. After the establishment of a project's requirements, the budget for a project can be determined. The requirements are determined in one or more of the following ways:

* Historical cost data for comparable projects that are properly adjusted for inflation, project location and special site conditions.

* Parametric cost estimates for the cost of the project which

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[59] Heery, George T., Thompsen, Charles B. Bridging. (p. 10).

use algorithms that are applied to the functions and physical characteristics of the project.

* Piece-of-pie cost estimates that are based on detailed square footage estimates of smaller representative portions of the facility.

By using one of these methods of estimating, there is the risk of approximating inflation at a fixed rate such as 5%. Increased accuracy can be obtained by predicting future local conditions which can produce cost swings of plus or minus 20%. Bridging has been successful in the past, and has proven that the results can be extremely accurate. By managing the project to meet an achievable budget, rather than estimating a design which will be bid a year or more in the future, Bridging makes budgeting easier.

Another area of Bridging which proves its flexibility and ease of application is the opportunity that it provides the contractor's design team to improve the original design specifications. With the traditional method of bidding, A/Es and contractors had to comply with detailed standards that limited their flexibility, were not the most cost effective and led to engineering overkill. Bridging stimulates continuous revision or improvement of standards. The brief and flexible standards given to the contractor and his team in the form of "contract documents", perpetuates innovation and allows the team to update and improve the standards and specifications.

Further, the advanced technology of new products increases the anxiety of the bidder (e.g., general contractors) who has to go

through complex, almost unreadable specification details to understand the project requirements. This led some of the bidders to avoid bidding and/or add contingencies to cover their risk of the unknown.

It is generally accepted that errors and omissions in the project drawings cost time and money to clients and contractors. Proof of this exists with the fact that insurance coverage for errors and omissions is typically half of an A/E's profit. This cost is passed on to owners as overhead. In addition, in case of a mistake, neither the architect nor the contractor can take care of the mistake without a change order or additional payment. Bridging provides solutions to these problems by uniquely delegating the design and construction responsibilities to a single entity. The results of delegating responsibilities depend upon the successful selection of the contractor, the effectiveness of the management team and the way that the funding and cost accounting issues are treated.

When a bidding process like Bridging is used, the Government evaluates the qualifications of each contractor and their staff. The expertise and skill of the management team and the contractor's A/Es may be more important than selecting the lowest bidder. Pre-qualification of contractors and pre-definition of the initial specifications can save the time and money of the Government and the contractor. In addition, the process of pre-qualifying bidders will attract the most competent contractors who will bid without the threat of loosing the job to a "mistaken low bidder."

The government control of the project should be given to a skilled manager, who is authorized to organize the construction team and the federal user. The manager should have the authority to block unnecessary or capricious changes in requirements during design and construction, and be authorized to request detailed information about the progress of the project from all parties. Simple, timely reports will enable management to track down problem areas and identify variances from the original schedule and budget.

The management team should make a significant effort to develop a cost accounting system that expedites the processing of funds and approvals and also be able to determine the overhead costs of the project. It is obvious that Bridging's implementation is easy and that its unique characteristics benefit a project by reducing its cost, expediting its schedule and improving its quality.

BRIDGING OBJECTIVES

Once a program for a project has been established there are three very important objectives that remain. These three factors are the budget, time schedule, and quality. As discussed in Chapter one, the ability to control these factors is important to the owner of a project. Bridging tends to maintain better control over these factors than the normal design/build process.[60]

CONTROLLING COST

It is widely known that the Department of Defense pays 50% of the total design cost to reach a 35% design. The cost of a 35%

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[60] Heery, George T., Thompsen, Charles B. Bridging. (p. 45).

design with the Bridging method is only 33% of the total design fee. Of the projects that are submitted to Congress only 70% of the projects are actually built. In some cases the funding occurs well after the design is complete, whereby redesign costs may be required. It is clear that, by reducing the degree of the initial design and by keeping the project in an alphanumeric state, there is a cost savings of 3-5%, including overhead costs. The design costs can be further reduced by 0.5%, since Bridging leaves the authority for changes and improvements up to the contractor's A/E. Bridging also allows the contractor to negotiate with subcontractors during the design phase and motivate them to suggest more cost effective construction techniques. With this ability the subcontractor, contractor and A/E eliminate the fear of unknown design criteria. Savings of up to 10% - 25% can be expected from these new relationships. Furthermore the modification and improvement of standards can result in a 10% savings over the total project cost.

With Bridging, the time between design and bid is minimized and saves the U.S. Treasury the interest on borrowed money and up to 1% of the total cost of overhead. Bridging also reduces the costs of claims and change orders. The average cost to the Department of Defense for change orders is 7% of the cost of a project. Contractors that are responsible for the construction and design tend to review the plans and specifications in order to reduce or eliminate errors. Ultimately the contractor claims caused by flawed plans and specifications are minimized.

It is evident that bridging can save 25% of the construction costs, while at the same time maintain or improve the existing specifications.[51]

SCHEDULE CONTROL

Another significant advantage to Bridging is the way that it allocates time over the various phases of the project. Bridging is perhaps the most efficient solution for schedule related problems in the construction industry. Understanding what causes stoppages and delays can save money. A project manager that can ensure that the construction process can continue without interruption will ultimately save money, time and maintain a project's quality. Bridging uses the following principles in order to maximize the efficiency of a schedule. These principles are:

* Adequate time is provided prior to design and construction so that the budget and initial requirements are as accurate as possible.

* The management plan comprehends and carefully analyzes, all required approvals as soon as possible.

* Design and construction are not or should not be interrupted and the teams involved in the design phase normally are involved through construction.[52]

CONTROLLING QUALITY

Proper utilization of Bridging guarantees that the project

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[51] Heery, George, T., Thompsen, Charles B. Bridging. (pp. 45-47).

[52] Heery, George T., Thompsen, Charles B. Bridging. (pp. 47-48).

will be completed with fewer interruptions and change orders than usual. An uninterrupted design will eventually produce a cost effective and functional project that conforms to the initial requirements. Therefore, the only limitation that Bridging might have concerning the project's quality is the way that the original requirements are defined.[53]

IMPLEMENTING STEPS OF BRIDGING

Bridging consists of five steps which serve different purposes, but all together they contribute to the successful completion of a project.[54]

STEP ONE

The first step of Bridging requires the owner's team to integrate the project requirements into a comprehensive alphanumeric document. This document should be adequate to help the team establish an achievable target budget, develop the management plan of the project and indicate the required approvals that should be obtained. As mentioned before, the requirements of the project should be thoroughly analyzed and included in a laconic report. This report should only establish design guidelines expressed in clear and concise statements. Special construction should be more detailed when preparing the project documents.

To set the budget of the project, value engineering and life cycle cost studies should be performed early on. In addition, an

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[53] Heery, George T., Thompsen Charles B. Bridging. (pp. 48-49).

[54] Heery, George T., Thompsen, Charles B. Bridging. (pp. 54-55).

achievable budget should be developed using historical data, parametric estimating adjusted for time, location and special project requirements and "piece-of-pie" estimating. Special attention should be given to the estimated rate of inflation used and to the project's final target budget. A written agreement between the Government, project managers and clients about the project's budget will eliminate the possibility of bids that are not within the target budget. In cases when the costs exceed the project's budget, it is the contractor's A/E's responsibility to rework the contract documents without further compensation in order to bring the project within budget.

Obtaining the owner's approvals is a procedure that should also be conducted during Step One. As many approvals as possible should be obtained prior to design. Those approvals or permits that can not be obtained until the completion of design (e.g., reviews from esthetics, planning or zoning board) should be constantly discussed with the using agency throughout the project.[65]

STEP TWO

Step Two defines all the environmental, maintenance, aesthetic, and other functions of the project that the owner or Agent wants to control. In this step, enforceable contract documents are prepared for bidding and the final approvals for design are obtained from the user. The contract documents include the drawings, specifications and agreements between the owner and

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[65] Heery, George T., Thompsen, Charles B. Bridging. (pp. 57-60).

the contractor. Unlike the traditional contract documents, Bridging documents define the owner's requirements but excludes specific construction means and methods. These documents should be detailed enough to enable the contractor to obtain a lump sum bid and prices from other subcontractors without the need for additional design. In the contract documents the amount of the lump sum bid designated for final engineering should be clearly specified. This requirement attempts to control excessive design fees and eliminate bid shopping during the engineering stage.

The contract documents also include a clause whereby, at the end of the engineering phase or up to 120 days later, the Government can terminate the contract. If for any reason the contractor's construction drawings and specifications or final engineering schedule are not approved by the owner or the Government's A/E, the contractor will not be paid for the engineering phase. In such cases the contract may not be terminated, but rather the contractor will be given a period of time to revise and resubmit the construction documents.

The contract documents should also clearly state that the Government may terminate the contract at any time during final engineering with no additional financial obligation to the contractor other than the fee earned for the engineering phase. Since the final engineering documents are Government property, they can then be used by the Federal Agency to take bids from other contractors. This allows the Government the ability to efficiently

negotiate unreasonable contractor claims and change orders.[66]

STEP THREE

This step narrows the field of the pre-qualified contractors. After pre-qualifying contractors, the contract is awarded to the lowest bidder. At the award, the contract gives the contractor the permission to proceed with the final design, prepare the construction documents, and start pre-construction activities.[67]

STEP FOUR

The purpose of this step is the development of the detailed construction documents and to define the means by which the contractor will build the designed project. The construction technology and methods are determined by the contractor, however, the end product should comply with the original contract's requirements. Representatives of the Air Force, the owner and or the Government's A/E should have access to, but not interfere with the project's drawings.

The contractor at this point can not begin construction until the completion of the final design. Furthermore, the contractor can not adjust the price during the final design phase without approved change orders. With Bridging, the contractor can use innovative construction techniques. If during the final design phase, the contractor negotiates with manufacturers and subcontractors and finds solutions that meet the contract

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[66] Heery, George T., Thompsen, Charles B. Bridging. (pp. 61-63).

[67] Heery, George T., Thompsen, Charles B. Bridging. (p. 64).

requirements, the total amount saved becomes profit. If the proposed innovative solutions do not meet the specified requirements but are acceptable by the Air Force owners, the savings are shared by both parties.[68]

STEP FIVE

The construction of the project begins after the final design documents have been reviewed, all pre-construction change orders have been signed and project costs are within the predetermined budget. The contractor at this point uses the construction documents to obtain the building permits.

Shop drawings should be checked by the owner or the Government's A/E at least 20 to 30 days before the initiation of those related operations. The designs and contract documents for flexible space are prepared by the Government's A/E and completed construction documents are prepared by the contractor's A/E.

The Agent or the Government's A/E can request the revision of any of the shop drawings for errors or non-compliance with the construction documents. They are also responsible for the approval of any payment request submitted by the contractor. The price for the flexible space work is usually based on unit prices that are included in the original bid.[69]

THE AIR FORCE PERSPECTIVE OF BRIDGING

The advantages advertised by the Air Force's Bridging method

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[68] Heery, George T., Thompsen, Charles B. Bridging. (pp. 65-66).

[69] Heery, George T., Thompsen, Charles B. Bridging. (pp. 67-68).

over the traditional low-bid contract includes:

* A fixed-price contract in half of the time at half the cost.

* Fewer claims during the construction phase.

* Better Construction technology, Faster and cheaper.

* Single contractor responsibility for design and construction, during and after construction.[70]

The use of Bridging is not recommended for complex or unique projects.[71] In summary Bridging is recommended for simple projects like those recommended used with the Navy's Newport design/build method. The Air Force's Bridging method uses a fixed-price contract and sealed bidding that is also very similar to the Navy's Newport method. This method saves time, money, results in quality projects, and achieves the key factors desired by the U. S. Air Force.

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[70] Heery, George T., Thompsen, Charles B. Bridging. (p. 13).

[71] Heery, George, T., Thompsen, Charles B. Bridging. (p. 74).

FEDERAL AGENCIES AND DESIGN/BUILD CONTRACTING

CHAPTER V

OTHER FEDERAL AGENCIES AND DESIGN/BUILD

On 4 and 5 August 1987, the Federal Construction Council(FCC) arranged a design/build symposium. The symposium was a joint meeting of the FCC's Consulting Committees on Contract Management and Procurement Policy. Various federal agencies were invited to express their opinions on the use of design/build contracting in the federal sector. Several non-federal owners and design/build contractors were also in attendance. This chapter summarizes some of the remarks given during this symposium.[72]

CORPS OF ENGINEERS DESIGN/BUILD CONCEPT

The U. S. Army Corps of Engineers has utilized one-step design/build contracting primarily for family housing units. With the passage of Public Law 99-167, however, the Army Corps of Engineers pursued several non-housing design/build projects. The Army Corps of Engineers' concept was to use an RFP solicitation. The evaluation would first be judged according to quality prior to revealing the cost proposals. Award would then be recommended based on the highest quality point value per dollar.

Some of the first negotiated contracts used by the Corps were an $18 million medical clinic and a $13 million communication facility. These projects were complex and/or time critical to the Army procurement process. The Army indicated that the design/build

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[72] The Design/build Approach to Acquiring Facilities. (Preface p. vii).

process "leading to award is labor-intensive and requires special knowledge and skills."[73] Even though the Corps use of design/build was successful, it was not viewed as a most promising technique.

GENERAL SERVICES ADMINISTRATION AND DESIGN/BUILD

The General Services Administration(GSA) developed a design/build model shortly after the three armed services were authorized limited use of design/build contracting. GSA pursued design/build with the hope of saving both time and money in their construction program. Again an RFP format was selected, whereby offerors submitted technical proposals and price proposals. The technical proposal consisted of four main elements. These include:

Past Performance - (how well they performed)

Key Personnel - (qualifications and registrations)

Experience - (work history)

Management Approach - (organization)

Of the four elements, the GSA puts the most emphasis on past performance. A panel recommends their selection to the contracting officer based only on the technical proposal. The contracting officer must then make a final selection, which is most advantageous to the government. There are no formulas used in this selection, it is based on both the technical proposal and the price.

The GSA is continuing its use of design/build construction and has established a policy when design/build contracting can be used.

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[73] Schroer, C. R. The Design/build Approach to Acquiring Facilities. (pp. 11-13).

GSA uses design/build on major and minor projects when:

* Both design and construction funds are available to allow for a single procurement action.

* There is a need for project expediency

* The project scope of work is not too complex.

GSA also employs a construction quality manager to administer and oversee the construction phase of a design/build project.[74]

POSTAL ACQUISITION BY DESIGN/BUILD

Since the Postal Service reorganized in 1986 approximately twenty projects are being planned using design/build contracting. The Postal Services main concerns are to control costs and maintain quality. The contract type chosen by the Postal Service to control cost is a fixed-fee with a guaranteed maximum price contract. There is also a termination clause available at the end of the design phase should costs be excessive. The right to select the quality of materials during the design is also retained by the Air Force.

The Postal Service feels that there are still procurement regulations and laws that limit the effective use of design/build contracting. The success of design/build by this agency seems to be directly related to the quality of the personnel participating in the project. Design/build will continue to be used on selected projects in the Postal Service.[75]

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[74] Lincoln, Alex. The Design/build Approach to Acquiring Facilities. (pp. 15-16).

[75] Ours, Harold E. The Design/build Approach to Acquiring Facilities. (pp. 19-20).

ENVIRONMENTAL PROTECTION AGENCY AND DESIGN/BUILD

In 1987, Public Law 110-4 allowed the Environmental Protection Agency(EPA) the authority to fund design/build projects. At this time, the legislation restricts the value of any EPA project to a maximum cost of $8 million. Since the EPA does not contract directly with contractors, there are some unique problems with the use of design/build contracts. The EPA only provides grants to local municipalities to contract for engineering and construction services. The EPA feels that the use of design/build in their specific field of wastewater treatment plants, is best suited for large projects with well-defined industry construction standards. As a result, EPA is evaluating the best way to implement design/build contracting.[15]

NON-FEDERAL OWNERS PERSPECTIVE

Three major American firms voiced their opinions about design/build contracts at the symposium. The results varied depending primarily on the project requirements. The results of using design/build methods parallel those found by federal agencies.

The Dupont Company is primarily engaged in building technology oriented facilities. The rapid process of transferring technology to a contractor, in order to build a facility, is essential to maintain market share. The complexity of transferring this technology on a fixed-price design/build basis has not been

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[15] Hanlon, James A. The Design/build Approach to Acquiring Facilities. (pp. 21-23).

successful. Dupont requires facilities that are cost-effective and state-of-the-art. The ability to rapidly redesign during construction has not been appreciated by Dupont, who feels that contractors cut investment in order to optimize profit.[77]

International Business Machines(IBM) Corporation has not been pleased with the results of design/build contracting. Design/build contractors are viewed as "great deal" and "glitter" salesmen. The end result is that there are obvious "design hold backs" in order to get "upgrade" changes. IBM will utilize an A/E in the future to provide the project concept prior to requesting proposals from design/build contractors.[78]

General Motors Company has used design/build contracting long enough to have developed a design/build philosophy. For the most part, General Motors prefers the traditional approach to contracting construction. Design/build, however, was found well suited for simple/uncomplicated structures and utilities such as warehouses, office buildings, and proprietary process systems(e.g., paint shops). In order to keep abreast of new technology and development, General Motors does not anticipate using design/build for assembly line facilities.[79]

In summary, the use of design/build construction in the

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[77] Brose, R. F. The Design/build Approach to Acquiring Facilities. (pp. 35-42).

[78] Marsh, Edward A. The Design/build Approach to Acquiring Facilities. (pp. 43-44).

[79] Brown, Andrew. The Design/build Approach to Acquiring Facilities. (pp. 45-51).

private industry is recommended for use in the construction of simple facilities with proven technology and uncomplicated features. This is the same recommendation as made by the Navy's Newport design/build method. The use of negotiated design/build contracts, on complicated private projects, met with less than favorable results. This parallels the results obtained by the Corps of Engineers design/build contracts.

THE CONTRACTOR'S PERSPECTIVE ON DESIGN/BUILD

The Associated General Contractor's(AGC) of America, had a policy against the use of design/build procurement on public work. Even though this restriction no longer exists, there are still concerns over the subjective nature of the design/build selection process. Some of the other concerns with design build include:

1) The large initial expenditure required to prepare a competitive proposal for design/build procurement.

2) Competition will be restricted due to the high cost of preparing such proposals.

3) The AGC feels that design/build contracts will require more owner supervision, rather than less as advertised.

4) The subjectivity of the selection process invites litigation from disappointed bidders.

5) The AGC recommends construction management over design/build contracting in order to achieve "single source" responsibility.[80]

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[80] Lathlaen, R. F. The Design/build Approach to Acquiring Facilities. (pp.59-60).

Even though these concerns exists there is a lot of design/build contracting in the private industry. Surprisingly eighteen percent of the total construction companies surveyed in 1987 stated that they were design/build organizations.[81] There is apparently a very large market for design/build contracting in the private construction industry.

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[81] Arditi, David. Construction Productivity Improvement. In Legal Handbook for Architects and Engineers. (1987). Clark Boardman Company, Ltd. New York, New York. (pp. 5, 7, 29, & 54).

CHAPTER VI

THE FUTURE OF DESIGN/BUILD IN FEDERAL AGENCIES

The use of the traditional low bid contract in Federal construction has been the industry standard for many years. Due to past and present economic conditions within the United States and throughout the world, there has been an increased emphasis on efficiency. The promotion of design/build contracting, by Congress, within federal agencies, has proven to be an effective alternative to the traditional low bid contract method. Consequently, the use of Federal design/build contracts has increased significantly, since 1985.

In the past few years, the ethical concerns of the construction industry and the professional architectural societies, which once restricted design/build contracting, have disappeared. These same organizations now prescribe the contractual documents by which design/build contracting is implemented. The legislatures of many states are also revising their statutes to permit design/build contracting with state funded projects. The courts are establishing the precedents by which design/build contracting is conducted, and the insurance companies have developed policies for the liability coverage required of design/build contracting.

The overall future of Federal design/build contracting is bright. The need is here now and will not disappear soon. The advantages of design/build over the traditional method of contracting are significant and should be used when conditions warrant.

FEDERAL AGENCIES AND DESIGN/BUILD CONTRACTING

CONCLUSION/RECOMMENDATIONS

The design/build contracting success of the U. S. Navy and the U. S. Air Force can be attributed to their implementation techniques. The use of detailed performance specifications in a low bid process allows a contractor to be creative and meet the requirements of the owner. This type of contract is best suited for simple or commercially equivalent types of facilities. The use of low bid design/build contracts for complex facilities has not been successful in the public or private construction industry.

The negotiated design/build contract is limitedly successful and requires far more administrative effort in its implementation. There is, however, the need for negotiated design/build contracts when the requirements for a project are not firmly known or there is sufficient justification for urgent construction. The Federal use of negotiated design/build contracting should, therefore, remain limited.

The estimated savings of twenty percent of a project's cost as indicated by the Navy's Newport method is impressive. It is recommended that low bid design/build contracting continue with non-complex projects. The Navy's increased use of design/build contracting at all Engineering Field Divisions is a step which other Federal agencies should follow in order to help the national economy and to stimulate creativity within the construction industry. The Federal Government should continue its pursuit of design/build contracting and seek other alternative contracting methods to further increase its efficiency.

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